

Fig. 1

<u>Inst</u>	<u>Hit/Miss</u>	<u>Data</u>	
18 — LDR [R _m]	Hit	Data [R _m]	
MOV	N/A	—	
CMP	N/A	—	
⋮	⋮	⋮	
20 — LDR [R _m]	Miss	—	<div> <div></div> <div>variable delay</div> <div></div> </div>
MOV	N/A	—	
CMP	N/A	Data [R _m]	
⋮			
22 — LDR [R1]	Miss	—	
24 — LDR [R2]	Miss	—	
MOV	N/A	—	
CMP	N/A	28 — Data [R2]	<div> <div></div> <div>missed data returned out of order</div> <div></div> </div>
ADD	N/A	26 — Data [R1]	

Fig. 2

Instruction Trace Stream

⋮

30 — LDR [R1] -- miss
 MOV
 CMP
 34 — LDR [R2] -- hit
 LDR [R3] -- miss
 38 — ADD
 MOV
 SUB
 ⋮

Data Trace Stream

⋮

32 — Data Place Holder Tag 1
 —
 —
 36 — Data [R2]
 Data Place Holder Tag 2
 40 —
 42 — Late Data Tag 2 [R3]
 44 — Late Data Tag 1 [R1]
 ⋮

Fig. 3

Instruction Trace Stream

⋮

46 — LDR [R1] -- miss
 CMP
 ADD
 LDR [R2] -- hit
 50 — LDR [R3] -- miss
 SUB
 MOV
 56 — LDR [R4] -- miss
 CMP
 MOV
 ⋮

Data Trace Stream

⋮

48 — Data Place Holder Pending
 —
 —
 52 — Data [R2]
 Data Place Holder 1 pending
 54 — Late Data [R1]
 —
 58 — Data Place Holder 1 pending
 Late Data [R3]
 Late Data [R4]
 ⋮

Fig. 4

Instruction Trace Stream

62 (LDR [R1] --- miss)
 (MOV)
 SUB
 ↓
 earliest trace info.
 SYNC {1 pending}
 60 LDR [R2] --- miss
 CMP
 ADD
 64 LDR [R3] --- hit
 MOV
 SUB
 CMP
 ...
 ...

Data Trace Stream

(Data Placeholder)

—
 —
 —
 66 Data Placeholder
~~Late Data [R1]~~
 68 —
 —
 Data [R3]
 Late Data [R2]
 70 —
 —
 ...
 ...

Fig. 5

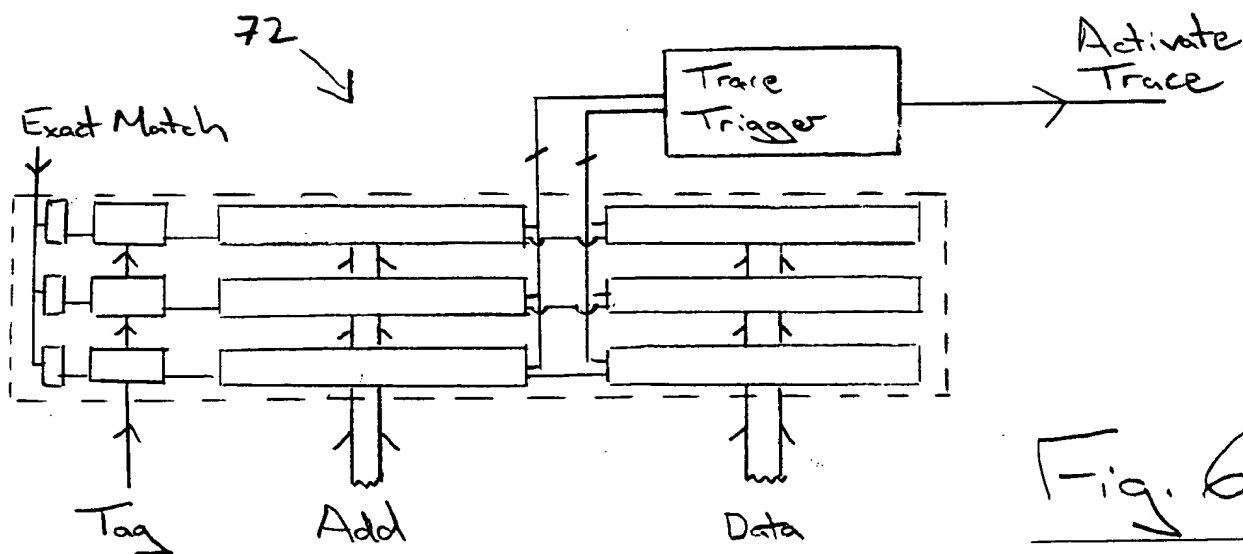


Fig. 6

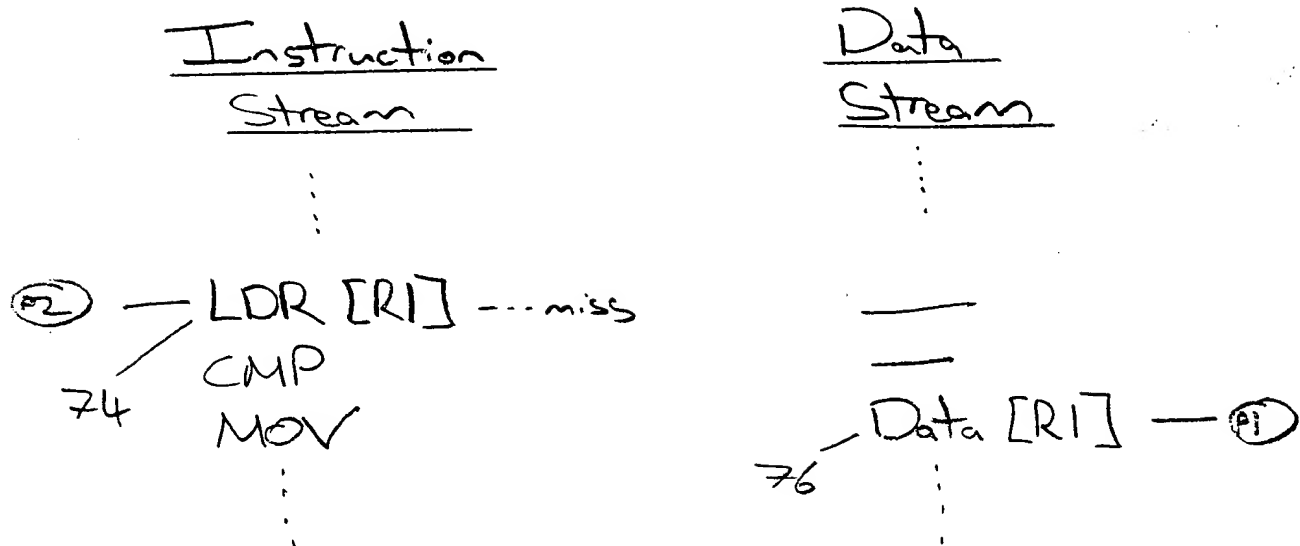


Fig. 7

Exact Match	Add Match	Data Match	Trace Activation Point
✓	✓	✓	①
✓	✓	X	none
X	✓	✓	②
X	✓	X	②

Fig. 8

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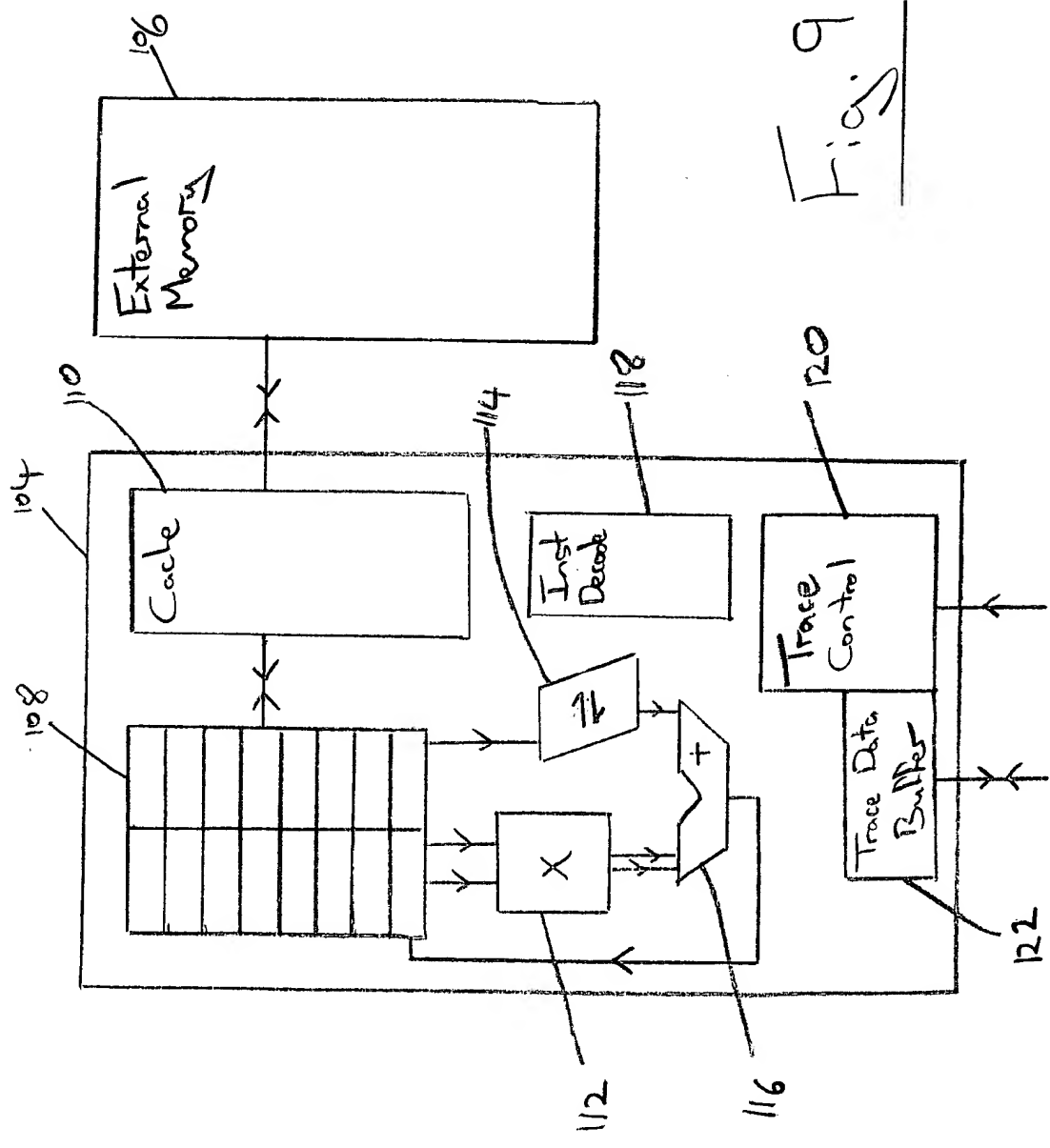


Fig. 9

LSM $R_n[Add]$, $RegList$

16 bits

0000100010001011



R0	
R1	
R3	R11
R7	

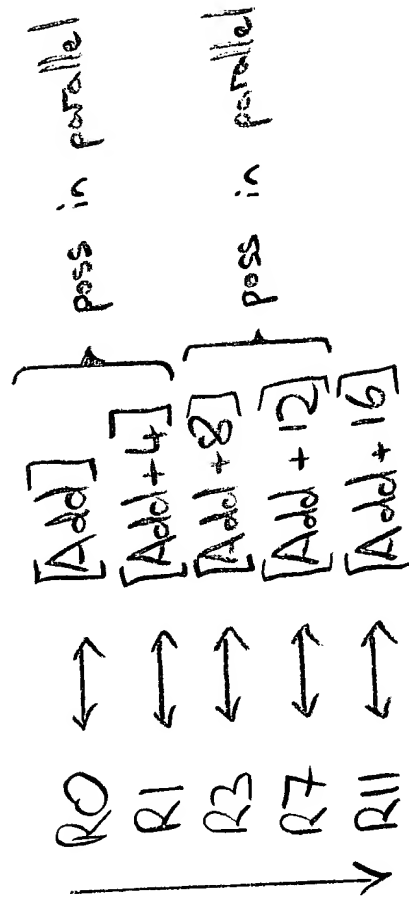


Fig. 10

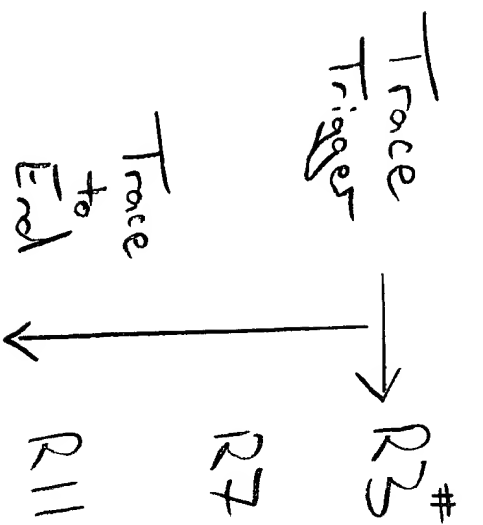
$$R0 \xleftrightarrow{DW_1} [Add]$$

$$R1 \xleftrightarrow{DW_2} [Add+4]$$

$$R3 \xleftrightarrow{DW_3^*} [Add+8]^!$$

$$R7 \xleftrightarrow{DW_4} [Add+12]$$

$$R11 \xleftrightarrow{DW_5} [Add+16]$$



\Rightarrow

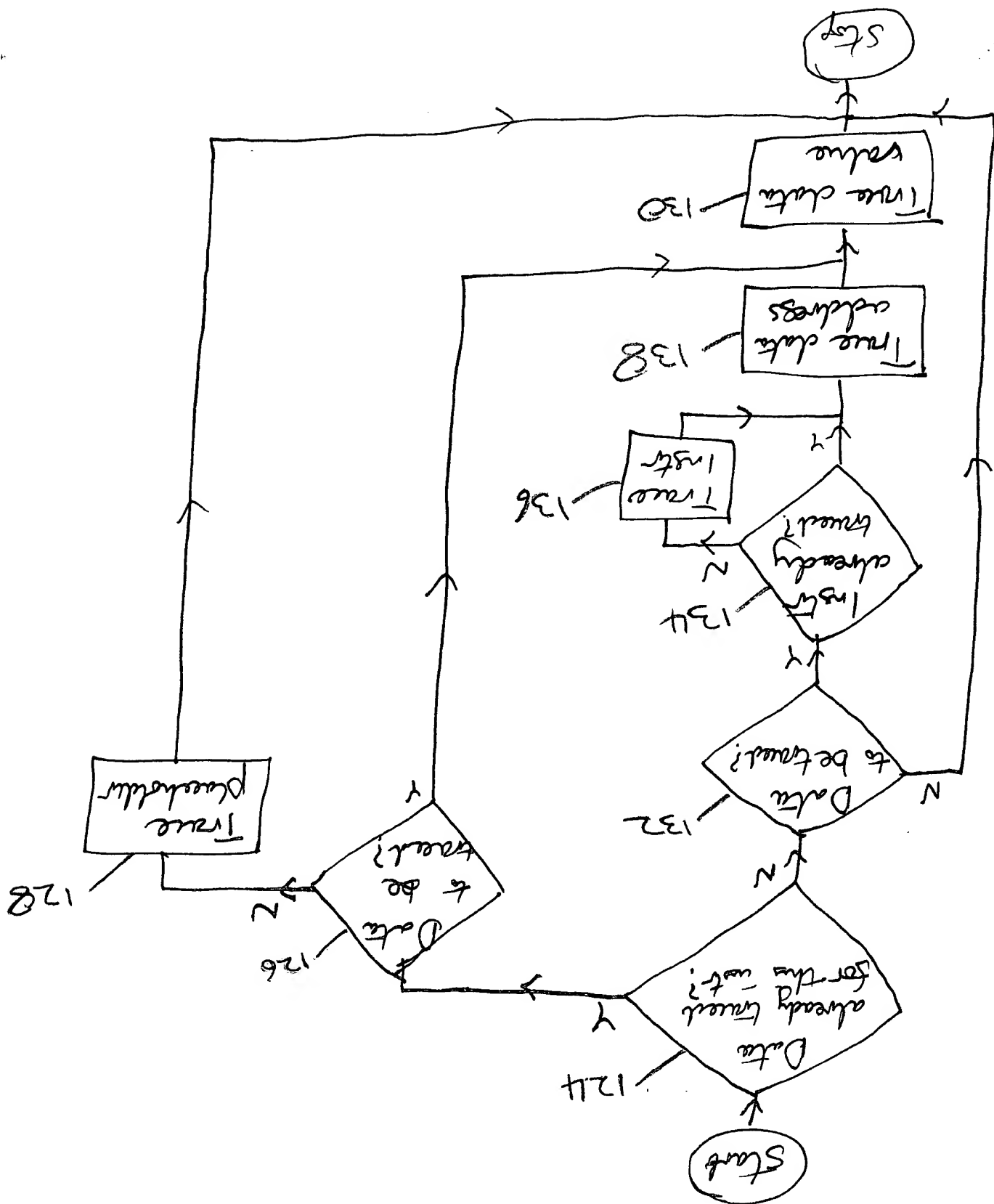
Trace Data Stream

..., {LSM}, {Add+8}, {DW3}, {Place Holder}, {Place Holder}, ...

Count back to R3

Fig. 11

Fig. 12



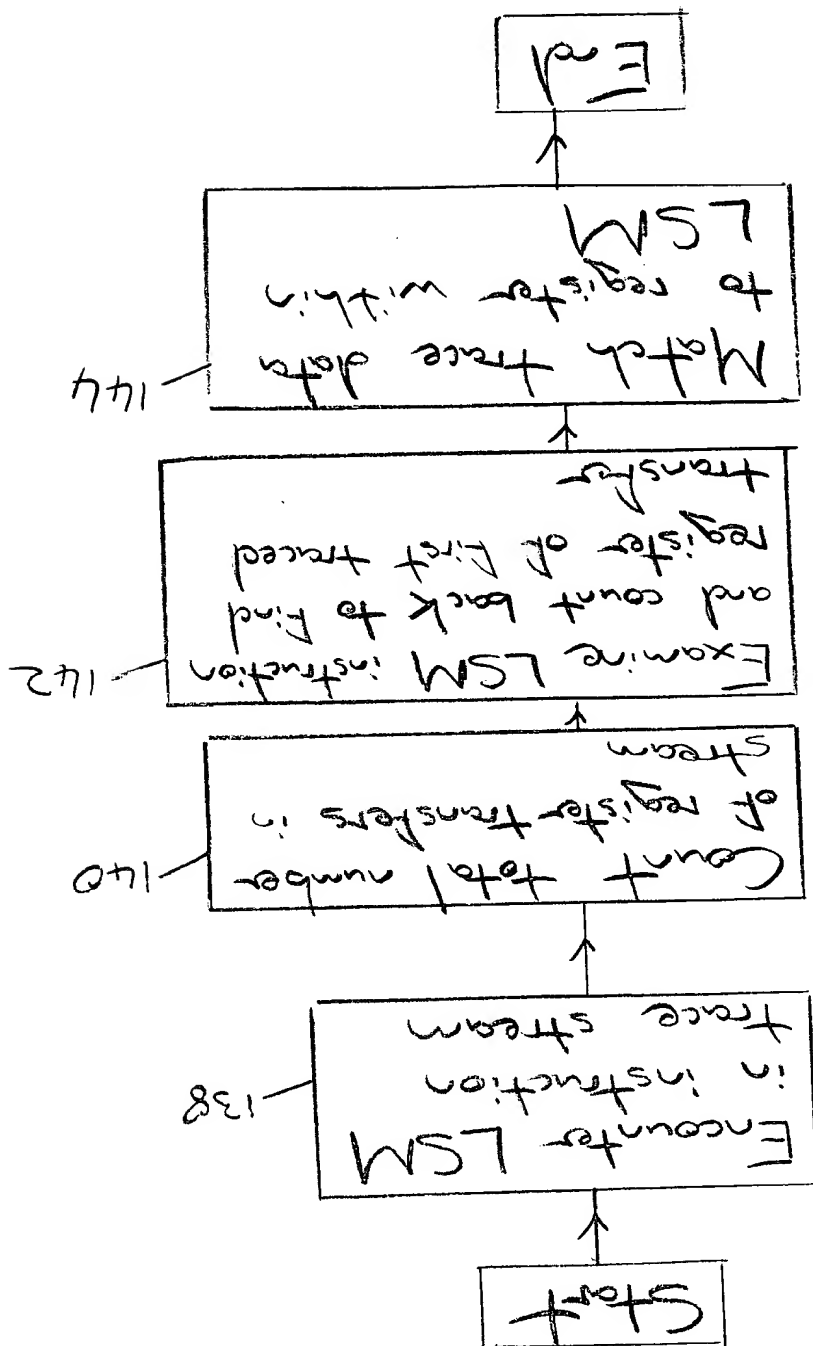


Fig. 13